AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. (Original) A hybrid multistage cryocooler comprising:

a first-stage expander having a first-stage expander outlet;

a first-stage thermal interface;

a second-stage expander in communication with the first-stage expander outlet, via the first-stage thermal interface; and

a surge volume in communication with a second-stage expander outlet of the second-stage expander, via the first-stage thermal interface;

wherein the surge volume is maintained at an ambient temperature.

2. (Original) The cryocooler of claim 1, further comprising an inertance tube coupling the surge volume to the first-stage thermal interface.

3. (Currently Amended) The cryocooler of claim 2, wherein a first end of the inertance tube is at the ambient temperature, and wherein a second end of the inertance tube is <u>at</u> a first-stage temperature that is lower than the ambient temperature.

4. (Original) The cryocooler of claim 2, wherein the inertance tube is thermally coupled to a cold cylinder surrounding an expansion volume that is in gaseous communication with the first-stage expander outlet.

5. (Original) The cryocooler of claim 1, wherein the first-stage expander is a Stirling expander.

6. (Original) The cryocooler of claim 5, wherein the Stirling expander includes:

a cold cylinder surrounding an expansion volume that is in gaseous communication with the first-stage expander outlet;

a displacer which forces a working gas through the expansion volume and a first-stage regenerator; and

a motor that drives the displacer.

7. (Currently Amended) The cryocooler of claim 1, wherein the second-stage expander is a pulse tube expander.

8. (Original) The cryocooler of claim 7, wherein the pulse tube expander includes:

a pulse tube inlet;

a pulse tube gas volume in gaseous communication with the pulse tube inlet, the gas volume including a second-stage regenerator and a pulse tube gas column; and

a second-stage heat exchanger in thermal communication with the second-stage regenerator and the pulse tube gas column.

9. (Original) The cryocooler of claim 1, wherein the first-stage thermal interface is maintained at a first-stage cold temperature that is lower than the ambient temperature.

10. (Original) The cryocooler of claim 9, wherein the first-stage thermal interface is coupled to an expansion volume of the first-stage expander.

11. (Original) The cryocooler of claim 10, further comprising an inertance tube coupling the surge volume to the first-stage thermal interface.

12. (Original) The cryocooler of claim 10, wherein the first-stage thermal interface is cantilevered off the expansion volume.

13. (Original) The cryocooler of claim 1, wherein the surge volume is within the Stirling expander.

14. (Original) The cryocooler of claim 1, wherein the surge volume is inside at least part of a plenum of the Stirling expander.

15. (Original) The cryocooler of claim 1,

further comprising an ambient-stage structure;

wherein the surge volume and at least the first-stage expander are mechanically coupled to the ambient-stage structure.

16. (Currently Amended) A hybrid multistage cryocooler comprising:

a first-stage expander having a first-stage expander outlet;

a first-stage thermal interface;

a second stage in communication with the first-stage expander outlet, via the first-stage thermal interface;

a surge volume in communication with a second-stage expander, via the first-stage thermal interface; and

an inertance tube coupling the surge volume to the first-stage thermal interface;

wherein the surge volume is maintained at an ambient temperature;

wherein a first end of the inertance tube is at the ambient temperature,

wherein a second end of the inertance tube is <u>at</u> a first-stage temperature that is lower than the ambient temperature;

wherein the first-stage expander is a Stirling expander;

wherein the first-stage thermal interface is coupled to an expansion volume of the first-stage expander; and

wherein the first-stage thermal interface is cantilevered off the expansion volume.

17. (Original) The cryocooler of claim 16, wherein the surge volume is within the Stirling expander.

18. (Original) The cryocooler of claim 16, wherein the surge volume is in at least part of a plenum of the Stirling expander.

19. (Currently Amended) The cryocooler of claim 16,

further comprising an ambient-stage structure; and

wherein the surge volume and at least the first-stage expander are mechanically coupled to the ambient-stage structure.

20. (Original) A method of cooling, comprising:

providing a first-stage expander having a first-stage expander outlet;

providing a first-stage thermal interface;

providing a second-stage cooler in communication with the first-stage expander outlet, via the first-stage thermal interface; and

coupling a surge volume in communication with the first-stage expander outlet and the second-stage cooler, via the first-stage thermal interface, wherein the coupling includes placing the surge volume such that the surge volume is maintained at an ambient temperature.

21. (New) The cryocooler of claim 1, wherein the first-stage thermal interface is at a first-stage temperature that is lower than the ambient temperature.